

# CURRICULUM VITAE

**Name:** Kenneth Alan Snyder

**Date of Birth:** 26 October 1965

**Citizenship:** United States

**Education:** B.S. Engineering Physics, January 1990  
Cornell University

Presently a Ph.D. Candidate, Physics Department  
University of Maryland

**Experience:** 1/90–8/90 Research Assistant,  
Department of Civil & Environmental Engineering  
Cornell University

8/90–present, Physicist,  
Building Materials Division  
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**Professional Societies:** American Physical Society  
RILEM  
American Society for Testing and Materials

**Honors:** American Society of Civil Engineers  
Materials Engineering Division  
Best Basic Research Paper, 1992  
(with K. Natesaiyer and K. Hover)

American Concrete Institute  
National Capital Chapter  
1995 Outstanding Accomplishment Award  
(with L. Kaetzel and J. Clifton)

## EXPERTISE

**Transport Measurements:** Laboratory transport measurements have included gas permeability, impedance spectroscopy (bulk electrical conductivity), divided cell diffusion test.

**Microstructural Studies:** Have studied the effects of 90% relative humidity exposure after 6 hours, 12 hours, and 3 days of curing. These studies included the use of a thermal-gravimetric analyzer (TGA) and a differential scanning calorimeter (DSC).

**Laboratory Experimentation:** 1) Have assembled an exposure chamber with both temperature and humidity control through PID controllers. An FT-IR purge gas generator supplies air that is devoid of both water vapor and carbon dioxide. 2) Have assembled apparatus to perform the ASTM C 1202 rapid chloride test on 8 specimens simultaneously, with the capability of 16 specimens through the purchase of an additional chassis. The apparatus uses commercial modular power supplies, is controlled by computer, and monitors current every 60 seconds.

**Degradation Modeling:** The computer program **4sight** was developed for the U.S. Nuclear Regulatory Commission to facilitate performance assessment of underground low level nuclear waste disposal sites. The computer model can account for the effects of acid attack, leaching, corrosion of the steel reinforcement, and sulfate attack. Further, these degradation mechanisms are addressed simultaneously to incorporate synergistic effects.

## MAJOR CONTRIBUTION

**Book Chapter:** *Materials Science of Concrete VII* (Skalny and Mindess, editors) will include a chapter entitled, "The Stereological and Statistical Properties of Entrained Air Voids in Concrete: A Mathematical Basis for Air Void System Characterization," by K.A. Snyder, K. Natesaiyer, and K.C. Hover. The paper summarizes a number techniques for air void characterization: uncertainty in ASTM C 457 measurements; the relationship between planar and linear probe data and the air void radius distribution; thin section data analysis; the geometrical accuracy of spacing equations; and the estimation of the protected paste volume.

## SERVICE

- Member of RILEM Committee TC IDC, “Internal Damage of Concrete due to frost action.”
- Member of ASTM C 09.65 (Petrography) and C 09.69 (Miscellaneous Tests). Chairman of C 09.65 Task Group to develop uncertainty expression for standard method ASTM C 457.
- Lecturer for ACBM/NIST Computer Modeling Workshop, 1991–1999.
- Journal Referee: *Physical Review A*, *ASCE Journal of Materials*, *Annalen der Physik*, *Journal of Thermophysics and Heat Transfer*.
- Proposal Review: Advanced Technology Program (U.S. Department of Commerce), Office of Energy Research (U.S. Department of Energy), American Chemical Society.

## SELECTED TALKS, SEMINARS, and POSTERS

**Materials Research Society (Boston, MA)** : “A computer program to facilitate performance assessment of underground low-level waste concrete vaults,” 11/95.

**Laboratory de Materiaux de Construction (Lausanne, Switzerland)** : “The Particle-Particle and the Matrix-Particle Spacing Distributions for Non-Overlapping Spheres: Analytical and Numerical Results,” 10/97.

**Minneapolis Workshop on Frost Damage in Concrete (Minneapolis, MN)** : “Estimating the 95-th Percentile of the Paste-Void Spacing Distribution in Hardened Cement Paste Containing Air Entrainment,” 6/99.

**LOCALIZATION-99 (Hamburg, Germany)** : “Influence of impurities on the mode decay in excited nonlinear spring systems,” 7/99.

**American Ceramic Society** : “Conservation equation for multimode transport in saturated porous media,” 4/00.

**American Ceramic Society** : “Diffusive transport in ceramics,” 4/00.

**National Research Council (Ottawa, Canada)** : “Mass transport through concrete: Theoretical and experimental considerations,” 10/00.

**Materials Research Society** : “Formation factor in systems saturated with dilute electrolytes,” 11/00.

**Materials Research Society** : “Effect of speciation on diffusive transport in nonreactive systems,” 11/00.

## JOURNAL PUBLICATIONS

1. K.A. Snyder, K.C. Hover, K. Natesaiyer, "An Investigation of the Minimum Expected Uncertainty in the Linear Traverse Technique," *Cement, Concrete, and Aggregates*, CCAGDP, **13** (1), 3–10, Summer (1991).
2. K.A. Snyder, K.C. Hover, K. Natesaiyer, and M.J. Simon, "Modeling Air-Void Systems in Hydrated Cement Paste," *Microcomputers in Civil Engineering* **6**, 35–44, 1991.
3. K.A. Snyder, E.J. Garboczi, and A.R. Day, "The Elastic Moduli of a Simple 2-D isotropic composite: Computer Simulation and Effective Medium Theory," *Journal of Applied Physics*, **72** (12), 5948–5955, Dec. 15, 1992.
4. A.R. Day, K.A. Snyder, E.J. Garboczi, and M.F. Thorpe, "The Elastic Moduli of a Sheet Containing Circular Holes," *J. Mech. and Phys. of Solids*, **40**, (5), 1031–1051, 1992.
5. K. Natesaiyer, K.C. Hover, and K.A. Snyder, "Protected-paste volume of air entrained cement paste. Part I," *Journal of Materials in Civil Engineering* **4**, 166–184, 1992.
6. K. Natesaiyer, K.C. Hover, and K.A. Snyder, "Protected-paste volume of air entrained cement paste. Part II," *Journal of Materials in Civil Engineering* **5**, 170–186, 1993.
7. K.A. Snyder, J.R. Clifton, and L.I. Knab, "Freeze-Thaw Susceptibility of High Performance Concrete," *Wiss. Z. Hochsch. Archit. Bauwes. (Weimar)* **40**, 139–142, 1994.
8. K.A. Snyder and J.R. Clifton, "Measures of Air Void Spacing," *Wiss. Z. Hochsch. Archit. Bauwes. (Weimar)* **40**, 155–157, 1994.
9. E.J. Garboczi, K.A. Snyder, J.F. Douglas, and M.F. Thorpe, "Geometrical percolation threshold of overlapping ellipsoids," *Phys. Rev. E.*, **52** (1), 819–828, July 1995.
10. D.P. Bentz, J.R. Clifton, and K.A. Snyder, "Predicting service life of chloride-exposed steel-reinforced concrete," *Concrete International* **18**, 42–47, (December) 1996.
11. K.A. Snyder, "A numerical test of air void spacing equations," *Advanced Cement Based Materials* **8**, 28–44, 1998.
12. D.P. Bentz and K.A. Snyder, "Protected paste volume in concrete: Extension to internal curing using saturated lightweight fine aggregate," *Cement and Concrete Research* **29**, 1863–1867, 1999.

13. K.A. Snyder and T.R. Kirkpatrick, “Influence of Anderson localization on the mode decay of excited nonlinear systems,” *Annalen der Physik (Leipzig)* **8** (Special Issue) SI: 241–244, 1999.
14. K.A. Snyder, C. Ferraris, N. Martys, and E.J. Garboczi, “Using impedance spectroscopy to assess the viability of the rapid chloride test for determining concrete conductivity,” *Journal of Research NIST* **105**, 497–509, 2000 .
15. R. Barbarulo, J. Marchand, K.A. Snyder, and S. Prené, “Dimensional analysis of ionic transport problems in hydrated cement systems - Part 1: Theoretical considerations,” *Cement and Concrete Research* **30**, 1955–1960, 2000.

## CONFERENCE PROCEEDINGS

1. A.R. Day, M.F. Thorpe, K.A. Snyder, E.J. Garboczi, "Digital-Image-Based Study of Circular Holes in an Elastic Matrix," in **Mechanical Properties of Porous and Cellular Materials**, (eds. K. Sieradzki, D.J. Green, and L.J. Gibson), Materials Research Society Symposium Proceedings, Vol. 207, 95–102, Pittsburgh, PA (1991).
2. K.A. Snyder, D.N. Winslow, D.P. Bentz, and E.J. Garboczi, "Interfacial Zone Percolation in Cement-Aggregate Composites," in **Interfaces in Cementitious Composites**, **18**, 259–268, RILEM International Conference Proceedings, Toulouse, 1992.
3. K.A. Snyder, D.N. Winslow, D.P. Bentz, and E.J. Garboczi, "Effects of Interfacial Zone Percolation on Cement-Based Composite Transport Properties," in **Advanced Cementitious Systems: Mechanisms and Properties**, Materials Research Society Proceedings, **245**, 265–270, 1992.
4. D.P. Bentz, J.T.G. Hwang, C. Hagwood, E.J. Garboczi, K.A. Snyder, N. Buenfeld, and K.L. Scrivener, "Interfacial Zone Percolation in Concrete: Effects of Interfacial Zone Thickness and Aggregate Shape," in *Microstructure of Cement-Based Systems/ Bonding and Interfaces in Cementitious Materials* Materials Research Society Proceedings, **370**, 437–442, 1994.
5. K.A. Snyder, J.R. Clifton, and J. Pommersheim, "A computer program to facilitate performance assessment of underground low-level waste concrete vaults," in, *Scientific Basis for Nuclear Waste Management XIX*, Materials Research Society Proceedings, **412**, 491–498, 1996.
6. D.P. Bentz, K.A. Snyder, P.E. Stutzman, "Microstructural modelling of self-desiccation during hydration," *Self-Desiccation and Its Importance in Concrete Technology*, Edited by B. Persson and G. Fagerlund, Proceedings of an International Research Seminar in Lund, 132–140, (June) 1997.
7. D.P. Bentz, K.A. Snyder, P.E. Stutzman, "Hydration of Portland cement: The effects of curing conditions," *Proceedings of the 10th International Congress on the Chemistry of Cement* (Vol. 2), Edited by H. Justnes, 2ii078 (8 pp.), 1997.
8. M.J. Simon, E.S. Lagergren, and K.A. Snyder, "Concrete mixture optimization using statistical mixture design methods," *Proceedings of the PCI/FHWA International Symposium on High Performance Concrete*, Edited by L.S. Johal, 230–244, (October) 1997.
9. M.J. Simon, K.A. Snyder, and G.J. Frohnsdorff, "Advances in concrete mixture optimization," (invited paper), *Creating With Concrete*, Dhir ed., 1999.

## DISCUSSIONS

1. K.A. Snyder, "Discussion of 'Permeability evaluation of concrete bridge structures exposed to marine environment in Florida' " *Transportation Research Record* No. 1371, 44–45, 1992.
2. K. Snyder, "Discussion of 'A new technique for the measurement of the electric resistivity of concrete,' by V. Lakshminarayanan, P.S. Ramesh, and S.R. Rajagopalan'," *Magazine of Concrete Research*, **45** (162), 75–77, March 1993.
3. K. Natesaiyer, M. Simon, and K. Snyder, "Discussion of 'Mean Spacing of Air Voids in Hardened Concrete,' by E.K. Attiogbe," *ACI Materials Journal*, **91** (1), 123–124, Jan-Feb 1994.
4. K.A. Snyder, "Discussion of 'Influence of measurement technique on the air-void structure of hardened concrete,' by T. Aarre," *ACI Materials Journal* **93**, 512–514, 1996.
5. K.A. Snyder, "Discussion of, 'The use of the flow length concept to assess the efficiency of air entrainment with regards to frost durability: Part I—Description of the test method,' by R. Pleau and M. Pigeon," *Cement, Concrete, and Aggregate* **19**, 116–119, 1997.



## INTERNAL REPORTS

1. K.A. Snyder, J.R. Clifton, and N.J. Carino, "Nondestructive Evaluation of the In-Place Compressive Strength of Concrete Based Upon Limited Destructive Testing," NIST-IR 4874, National Institute of Standards and Technology, Gaithersburg, MD, 1992.
2. K.A. Snyder, J.R. Clifton "Calculating Cement Paste and Mortar Diffusivity from Conductivity Measurements: Preliminary Results Of a New Method," *NIST-IR*, **5235**, October 1993.
3. K.A. Snyder and J.R. Clifton, "4SIGHT Manual: A Computer Program for Modelling Degradation of Underground Low Level Waste Concrete Vaults," *NISTIR 5612*, National Institute of Standards and Technology, Gaithersburg, June 1995.
4. J.R. Clifton, J.M. Pommersheim, and K.A. Snyder, "Long-Term Performance of Engineered Concrete Barriers," *NISTIR 5690*, National Institute of Standards and Technology, Gaithersburg, July 1995.
5. D.P. Bentz, E.J. Garboczi, and K.A. Snyder, "A hard core/soft shell microstructural model for studying percolation and transport in three-dimensional composite media," *NISTIR 6265*, National Institute of Standards and Technology, Gaithersburg, 1999.
6. K.A. Snyder, "Effect of drying shrinkage cracks and flexural cracks on concrete bulk permeability," *NISTIR 6519*, National Institute of Standards and Technology, May 2000.